

3,647,284

889/463 358/

462 353/7,8,9

G I, claims 1-16 353/7,8

G II, claims 17-20 345/

10/628,541

Claims: I claim:

345/152/201
[1] The device that displays color 3 dimensional image(s) in the space in real time using

light virtual fields creating device means.

[2] The device of claim [1] wherein said light virtual fields creating device means is

composed of

- (1) Light rays directing device means
- (2) Light rays selecting device means
- (3) Optionally, Light source means
- (4) Optionally, mask means
- (5) Optionally, optical instruments means

[3] The device of claim [2] wherein said light rays directing device means is

composed of

pinhole arrays, micro-lens arrays, micro-mirror arrays, liquid crystal

pinhole arrays, varifocal pinhole lens, varifocal micro-lens array,

varifocal liquid crystal lens, varifocal liquid crystal micro-lens,

varifocal vertical liquid crystal lens, varifocal horizontal liquid

crystal lens, varifocal liquid crystal fresnel lens, micro-reflector,

varifocal micro-piezoelectric reflector, varifocal piezoelectric micro-

lens, adaptive optical lens, adaptive optical micro-lens

[4] The device of claim [2] wherein said light rays selecting device means is composed of

liquid crystal display, liquid crystal panels, liquid crystal panel with polarizing plate, micro-liquid crystal arrays, organic electro-luminescent display, inorganic electro-luminescent display, plasma display, laser arrays, diode laser arrays, electrodes, clear electro-conductive sheet

[5] The device of claim [2] wherein said light source means is composed of

light source, uniform light source, non-uniform light source diode light emitting plate, arc lamp, halogen light, electron beam emitter, light bulb

[6] The device of claim [2] wherein said mask means is composed of

masks, hole masks, liquid crystal masks

[7] The device of claim [2] wherein said optical instruments means is composed of

lens, micro-lens, index-gradient lens, pinhole lens, varifocal lens, liquid crystal varifocal lens, varifocal index-gradient lens, varifocal

liquid crystal varifocal lens, prisms, mirrors, curved mirrors, half-mirrors, color filters, polarizing plate

[8] The device of claim [1] wherein said light virtual fields creating device means is composed of

(1) Three dimensional image display units with flat or curved surface means

(2) Optionally, motion generating device means

[9] The device of claim [8] wherein said Three dimensional image display units with flat or curved surface means is composed of

(1) pinhole arrays, micro-lens arrays, micro-mirror arrays, liquid crystal pinhole arrays, varifocal micro-lens array

(2) liquid crystal display, liquid crystal panels, liquid crystal panel with polarizing plate, micro-liquid crystal arrays, organic electro-luminescent display, inorganic electro-luminescent display, plasma display, laser arrays, diode laser arrays

(3) Optionally, Light source means

(4) Optionally, mask means

(5) Optionally, optical instruments means

[10] The device of claim [8] wherein said motion generating means is composed of the group consisting of

linear stage, rotational stage, motors, linear motors, gears, bearing, magnetic oscillator, electro-magnetic motion generator, ultrasound motor

[11] The device that changes the focal length of lens using varifocal lens means

[12] The device of claim [11] wherein said varifocal lens means is composed of varifocal index-gradient lens means

comprising layers of materials that changes index of refractions such as varifocal liquid crystal index-gradient lens

comprising layers of liquid crystals that changes index of refractions by voltages driven by drivers

[13] The device of claim [11] wherein said varifocal lens means is composed of varifocal index-gradient lens means

comprising varifocal acousto-optic index-gradient lens

comprising layers of optic-optic materials crystals that changes direction of lights

[14] The device of claim [11] wherein said varifocal lens means is composed of varifocal pinhole lens

comprising liquid crystal pinhole or liquid crystal pinhole arrays
whose diameters change by the pattern created by liquid crystal
panels with polarizing plate

[15] The device of claim [11] wherein said varifocal lens means is composed of
varifocal micro-lens arrays

comprising electro-optic material micro-lenses
such as liquid crystal micro-lens array

[16] The device of claim [11] wherein said varifocal lens means is composed of
varifocal motion micro-lens arrays

comprising micro-lenses and the motion generating device such as
motors, magnetic motion generator, reciprocating motion generator,
ultrasound motion generator

345 (17) The device that has micro-arrays of light emitter means

[18] The device of claim [17] wherein said micro-arrays of light emitter means is
composed of

- (1) micro-lasers, micro diode lasers, photo-luminescent chemical
components
- (2) base means comprising silicon, glass, plastic
- (3) drivers

[19] The device of claim [17] wherein said micro-arrays of light emitter means is composed of

ferroelectric liquid crystal on uniform photo-luminescent chemical material

[20] The device of claim [17] wherein said micro-arrays of light emitter means is composed of

ferroelectric liquid crystal on uniform photo-luminescent chemical material

with micro-lens arrays,

nematic liquid crystal arrays on uniform photo-luminescent chemical

material with micro-lens arrays,